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Sharon Braude

Regarding the following Application:

Applicants:	YONA, Zvi et al.	Examiner:	CHANG, A.
Serial No./ Patent No.:	09/818,575	Group Art Unit:	2872

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ofc received 13 pages.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	YONA, Zvi et al.	Examiner:	CHANG, Audrey Y.
Serial No.:	09/818,575	Group Art Unit:	2872
Filed:	March 28, 2001	Attorney Docket No.:	P-3068-US
Title:	PERSONAL DISPLAY SYSTEM WITH EXTENDED FIELD OF VIEW		

Communication Accompanying Corrected Appeal Brief

Mail Stop **Appeal Brief – Patents**
Board of Patent Appeals and Interferences
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Notification of Non-Compliant Appeal Brief mailed by the United States Patent and Trademark Office on June 1, 2007, Applicants submit herewith a corrected Appeal Brief. A response to the Notification of Non-Compliant Appeal Brief is due July 1, 2007; accordingly, the corrected Appeal Brief is being timely field.

No fees are believed to be due in connection with this paper. However, if any fees are in fact due, please charge any such fees to deposit account No. 50-3355.

Respectfully submitted,

Guy Yonay
Attorney for Appellants
Registration No. 52,388

Dated: June 11, 2007

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APPEAL BRIEF

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I. Real Party in Interest

The real party in interest is Elbit Systems Ltd.

II. Related Appeals and Interferences

There are no related appeals or interferences known to the Appellants.

III. Status of the Claims

Claims 1-38 have been finally rejected.

Claims 1-38 are appealed.

IV. Status of Amendments

No amendment has been filed subsequent to the final rejection.

Applicants: YONA, Zvi et al. Attorney Docket No.: P-3068-US
Serial No.: 09/818,575

V. Summary of Claimed Subject Matter

The following is an explanation of the subject matter defined in each of the independent claims involved in this Appeal, followed by an explanation refering to the specification.

Independent claim 1 recites an apparatus comprising:

an image source to produce along a common optical axis at least first and second complementary images differing in at least one optical property selected from the group consisting of polarization and wavelength;

relay optics having a relay optics field of view associated with said images; and

a redirecting unit coupled to said image source to direct at least said first and second images to at least first and second different, respective, spatial regions of a reflecting unit based on said different optical property, thereby to enable viewing at least said first and second images together by an eye of a viewer as an integrated image having a field of view wider than said relay optics field of view.

Independent claim 8 recites an apparatus comprising:

an image source to produce along a common optical axis at least first and second complementary images;

relay optics having a relay optics field of view associated with said images; and

a redirecting unit coupled to said image source to direct at least said first and second images to at least first and second different, respective, spatial regions of a reflecting unit, thereby to enable viewing at least said first and second images together by an eye of a viewer as an integrated image having a field of view wider than said relay optics field of view, wherein said redirecting unit comprises a controllable tilting mirror.

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Independent claim 10 recites a helmet comprising:

a reflecting unit with operative connection to said helmet;

an image source to produce along a common optical axis at least first and second complementary images differing in at least one optical property selected from the group consisting of polarization and wavelength;

relay optics having a relay optics field of view associated with said images; and

a redirecting unit coupled to said image source to direct at least said first and second images to at least first and second different, respective, spatial regions of said reflecting unit based on said different optical property, thereby to enable viewing at least said first and second images together by an eye of a viewer as an integrated image having a field of view greater than said relay optics field of view.

Independent claim 17 recites a helmet comprising:

a reflecting unit with operative connection to said helmet;

producing along a common optical axis at least first and second complementary images differing in at least one optical property selected from the group consisting of polarization and wavelength;

optically transferring said complementary images through relay optics having a relay optics field of view; and

directing at least said first and second images to at least first and second different, respective, spatial regions of a reflecting unit based on said different optical property to enable viewing at least said first and second images together by an eye of a viewer as an integrated image having a field of view wider than said relay optics field of view.

Some embodiments of the invention include an apparatus for increasing the Field Of View (FOV) of an image without substantially increasing the size and the weight of a relay optics of the apparatus. One embodiment of the invention includes an optical system utilizing relay optics and visor, with increased FOV and using a lightweight relay optics. The whole image projected to the viewer 16 is composed of two or more fractions, each of which is relayed utilizing substantially the full FOV of the relay optics. (Specification, page 3, lines 14-20). The apparatus according to embodiments of the invention includes an image source for producing an image, relay optics with a first field of view, for optically transferring a whole image, a redirecting unit for selectively directing fractions of the image at at least two angles and a reflecting unit for reflecting the image fractions to a viewer. The redirecting unit switches between these angles at a speed high enough so that the image fractions received by the viewer are seamlessly integrated into a whole image having wider field of view than the first field of view. (Specification, page 2, lines 7-16).

As illustrated in Figure 2A, image fractions are produced by image source 30, received by relay optics 10, and deviated/reflected at a high speed in at least two directions by image redirector 40. These fractions are then superimposed in visor 15 at appropriate locations to be perceived by the viewer as a seamless

image made up of the fractions of the image. (Specification, page 3, lines 21-25 and page 4, lines 1-4; Figure 2A).

In particular, in the embodiment of the invention illustrated in Figure 2A, the projected image is split into two fractions 101 and 201, with substantially equal angle. The two images, image 101 reflected as image 101' to the left and image 201 reflected as image 201' to the right, one at a time in an alternating rate typically higher than 1 cycle each 25 milliseconds. Both images are reflected from the visor onto the viewer's eyes and received as one by the eye of the user, resulting in a field of view wider than that of each image singly. This allows producing multiple image fractions through one relay optics thus creating an integrated image with FOV substantially wider of the relay optics FOV by the number of the fractions. (Specification, page 4, lines 13-21; Figure 2A).

The movement of the projected fractions of the image on the visor is non-detectable by the eye using a repetition rate of 25 mill-seconds or less. The movement of the deviator/reflector in image redirector 40 is synchronized with the image source so as to allow for the projection of each of the image fractions onto its respectively correct position on the visor 15. (Specification, page 5, lines 8-12).

A time sequential of the operation of the apparatus, when operating as time domain device, i.e., an operation in which the different fractions of the image employ different time slots for projection, is shown in Figure 2B. The top line depicts the selective image fractions produced by image source unit 30, first image 101 and second image 201, and the bottom line depicts the reflective position of the image redirector 40, image 101 to the left and image 201 to the right. Thus, the image source 30 has to be synchronized with the image redirector when operating as a time-domain device. (Specification, page 5, lines 17-24; Figure 2B).

In another embodiment of the invention, as illustrated in Figure 3, the image produced in image source 30 is divided into two complementary frames, 72 with polarization P, and 74 with polarization S. Frame 72 represents the fraction of the

source image that corresponds to the first section on visor 15. Frame 74 represents the fraction of the source image that corresponds to the second section on visor 15. Both frames are projected through an optical combiner 70, and their respective out going optical lines 82 and 84 are projected simultaneously along a common optical axis from the optical combiner 70 through the relay optics 10 and optionally via an Electro Optical (EO) lens 76. When the EO lens 76 is in use, its activity is synchronized with the image source so to allow the free passage of only

composed image equals substantially to twice the original FOV angel of the relay optics. (Specification, page 7, lines 7-14; Figure 4B).

In another embodiment of the invention, as illustrated in Figure 5, a visor 15 includes diffractive optics 94 and 96 formed therein. Since the visor 15 is the last optical element before the eye, improving this element (the visor) improves the over-all system performance. Additionally, by adding the diffractive optics to the visor, it is possible to remove some of the optics from within relay optics 10, creating a lighter unit. (Specification, page 8, lines 9-14).

VI. Grounds of Rejection to be Reviewed on Appeal

The following grounds of rejection are to be reviewed in this Appeal:

A. The Examiner's contention that claims 1-7, 9-16 and 18-38 are unpatentable under 35 USC §112, First Paragraph, as failing to comply with the enablement requirement.

B. The Examiner's contention that claims 1-7, 9-16, 18-23, 35 and 37 are unpatentable under 35 USC §103(a) over United States Patent Number 6,094,283 to Preston ("Preston").

C. The Examiner's contention that claims 34, 36 and 38 are unpatentable under 35 USC §103(a) over Preston in view of United Stated Patent Number 5,198,928 to Chauvin ("Chauvin").

D. The Examiner's contention that claims 8 and 17 are unpatentable under 35 USC §103(a) over United States Patent Number 5,652,666 to Florence et al. ("Florence").

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Appellants further point to page 9, lines 1-5 of the specification, which discloses:

> Using the same optical relay 10 to achieve a non-distorted wide-FOV imagery, the field correction can be done by reverse-image correction manipulation on the image source such that the projected image to the eye will be non-distorted. Or the correction can be done on the reflected element 15 (visor/combiner) by using a powered reflected optical element such as diffractive, hologram, binary optics.

Accordingly, Appellants respectfully submit that the specification discloses using a reflecting unit, e.g., diffractive optics or hologram, to improve performance and/or efficiency in conjunction with the present invention. This reflecting unit may be used with either the wavelength embodiment or the polarization embodiment, to reflect the projected images to the eye of the user. Methods for optimizing the reflecting unit based on wavelength or polarization are known in the art. Accordingly, Appellants respectfully assert that the specification is enabling and the rejection is traversed.

Second, the Examiner further contended that the specification fails to teach how the redirecting unit could be a polarization selective reflective device that is capable of directing at least said first and second images to at least first and second respective spatial regions of a reflecting unit. The Examiner contended that it is known in the art that a polarization selective reflective device, to the most, can only reflect light with on particular polarization state, but will not be able to redirect light along a common optical axis into different directions (as required by claims 1, 10 and 19), unless a certain specific structure is designed to do so, and

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Appellants respectfully disagree with the Examiner's second grounds of rejection under Section 112 for the below reasons.

Appellants point out that the image source produces first and second complementary images differing in at least one optical property, and the redirecting unit directs the first and second images to first and second different, respective, spatial regions of a reflecting unit based on the optical property. Apparently, the Examiner admits that a redirecting unit is disclosed for the wavelength property, and that the redirecting unit is disclosed for the polarization property. The claimed invention does not require that the same redirecting unit be suitable for both wavelength and polarization redirecting, although a redirecting unit may combine the features of both a wavelength and a polarization redirector. Accordingly, the Examiner's rejection is respectfully traversed.

With regard to the Examiner's inquiry how can a redirecting unit be a polarization selective reflective device capable of directing said first and second images to first and second respective spatial regions of a reflecting unit, Appellants submit that such devices are (and were at the time of filing of the present application) well known to those of ordinary skill in the art.

Appellants point to page 7 of the specification, where it is stated that in one embodiment of the invention, "image redirector 40 . . . is embodied by an optical device 92 (such [as] a wedge with two polarization-dependent reflective planes)." Such a wedge having two polarization-dependent reflective planes, each for reflecting light of a different polarization, would operate to direct light polarized differently in different directions.

Appellants respectfully submit that the practical and theoretical bases for such an element described in the embodiment are well known in the art. For example, Appellants has attached to a previous response to Office Action (filed on August 16, 2004), and further enclose herein as Appendix A, pages 331-335 of a

Kingslake. In Appendix A, polarization by double refraction is described, for example by use of a Rochon or Wollaston prism.

Appellants further submit that other suitable devices are known in the art for such purposes and are commercially available. For example, Appellants have attached to a previous response to Office Action (filed August 16, 2004), and further enclose herein as Appendix B, pages 234-235 of a 1998-99 catalog for laser and photonics applications from Coherent, which offers for sale polarizing beamsplitting cubes and prisms. As explained therein, the effect of such devices is to receive an incoming beam and divide it into its component polarized components. Any of these devices is able to take a beam of a first polarization and direct it in a first direction and direct a second beam of a second polarization in a second direction.

Appellants point out that in the Final Office Action (bottom of page 3, top of page 4), apparently the Examiner admits that the "wedge with two polarization-dependent reflective planes", as disclosed in the specification, indeed enable the apparatus.

Third, the Examiner contended that the "wedge with two polarization-dependent reflective planes", which is disclosed in the specification, is essential structure for making the apparatus operable, but is not explicitly recited in the rejected claims.

With this third ground for rejection, too, Appellants respectfully disagree.

The "wedge with two polarization-dependent reflective planes", which is